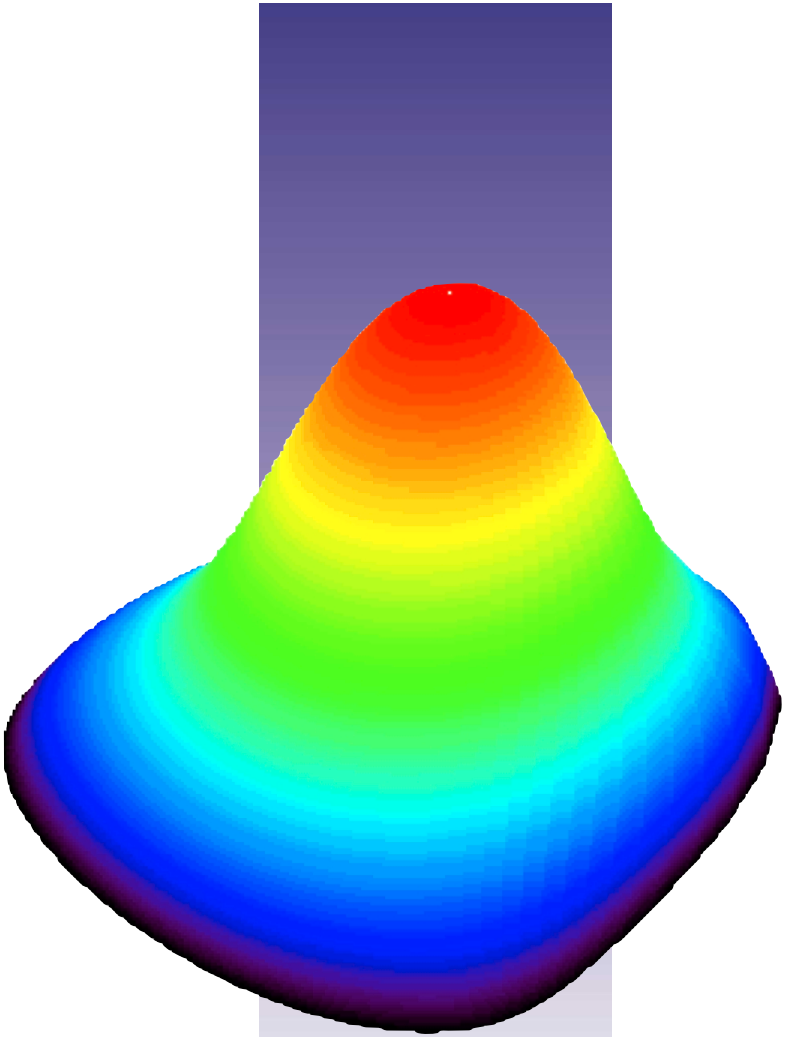

NIMROD simulated pressure stored in MDSplus and visualized with IDL

DATA ACCESS: A COMPUTER SCIENCE COLLABORATION BETWEEN THE US AND EFDA–JET IN COLLABORATION WITH EFDA–JET RP TASK E05.05.01

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Presented to

US/EFDA–JET Collaboration Meeting

February 22, 2001

Princeton, NJ

DIII–D NATIONAL FUSION FACILITY SAN DIEGO

OUR GOAL IS TO MAXIMIZE THE EFFECTIVENESS IN EXTRACTING SCIENTIFIC UNDERSTANDING

- Solving critical physics problems requires a capable computational infrastructure and the necessary tools
- Allow the scientists to concentrate on their science, not computer science
  - Provide them with their required infrastructure
- Strengthen coupling between modeling teams & theory and experiment
- Achieving our goal with minimal duplication of effort
  - Effective shared development and reuse of software components
  - Development of common shared tools for data manipulation & analysis

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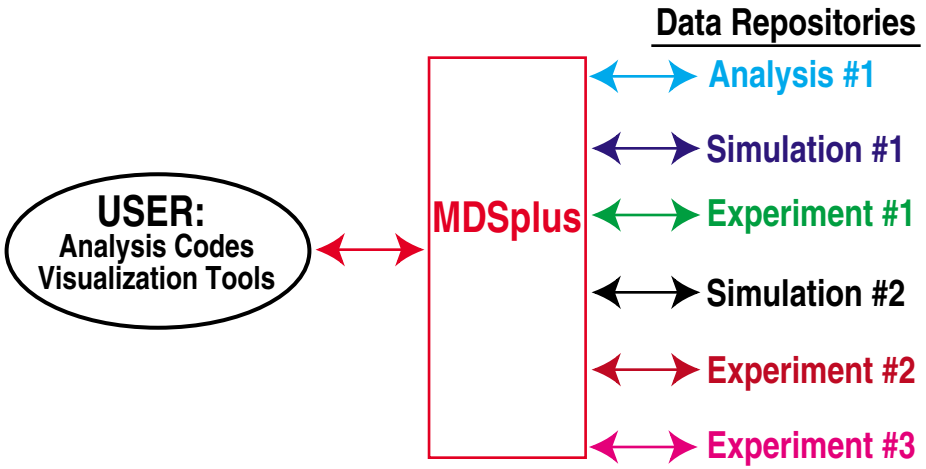
EFDA–JET RP TASK E05.05.01: STUDY OF JET RDA MODIFICATIONS AND EXTENSIONS

"A uniform approach is required to access data from different experiments."

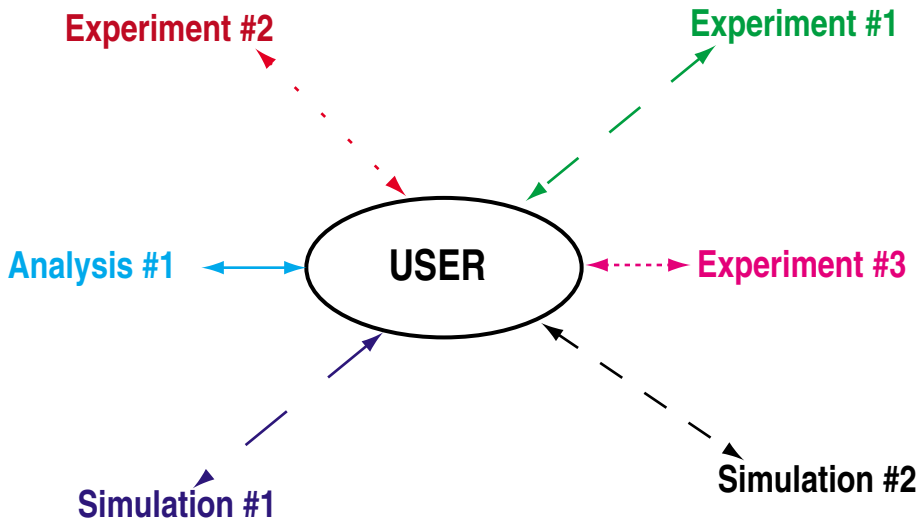
- **Each site maintains only one code to access all data**
  - Avoid the N x N problem: do not maintain every other site's software
- **Can the MDSplus data system satisfy the need?**
  - European sites: RFX Padova, EPFL Lausanne, FTU Frascati
  - US sites: GA, MIT, PPPL, UCSD, Columbia, U. of Washington, LANL, U. of Wisconsin
  - Other: Canberra (Australia), CHS (Japan), Hefei (China), KSTAR (Korea)
  - Clients at many sites

MDSplus CAN UNIFY DATA ACCESS BETWEEN LABORATORIES

Efficient: One interface to each lab



Time Consuming: Separate interface to each lab



- MDSplus acts as middle layer between user and each site's data access methods
- Each site needs only MDSplus which is easy to install
- Possible because MDSplus can transparently call other data access codes
- Existing data repositories do not need to be altered
- Proven technology: DIII–D raw data, TFTR data, CHS data, RFX Padova–FTU Frascati

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MDSplus PROVIDES A COMMON, SHARED, SECURED NETWORK ENABLED INTERFACE TO ALL DATA

- MDSplus is a data system jointly developed by MIT, LANL, & RFX Padova
  - Provides for acquisition, storage, access, and organization of data
  - Secure client/server system utilizing TCP/IP
  - Stores experimental as well as simulation data
- Many years of operating experience in the experimental community
  - Production use at C–Mod, TCV, & RFX since 1991, DIII–D & NSTX since 1997
  - Approximately 25 man–years of MDSplus development effort
- Many physics analysis codes have been or are being integrated with MDSplus
  - Transport: MIST, ONETWO, TRANSP
  - MacroStability & Equilibrium: DCON, EFIT, M3D, NIMROD, PEST
  - MicroTurbulence: GS2

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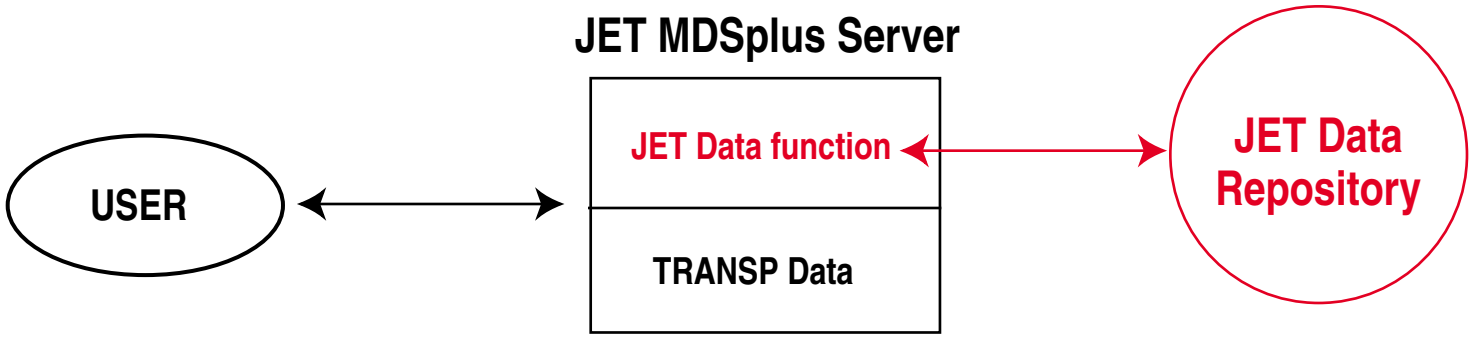
INITIAL TESTS OF ACCESSING JET DATA THROUGH MDSPLUS SUCCESSFUL

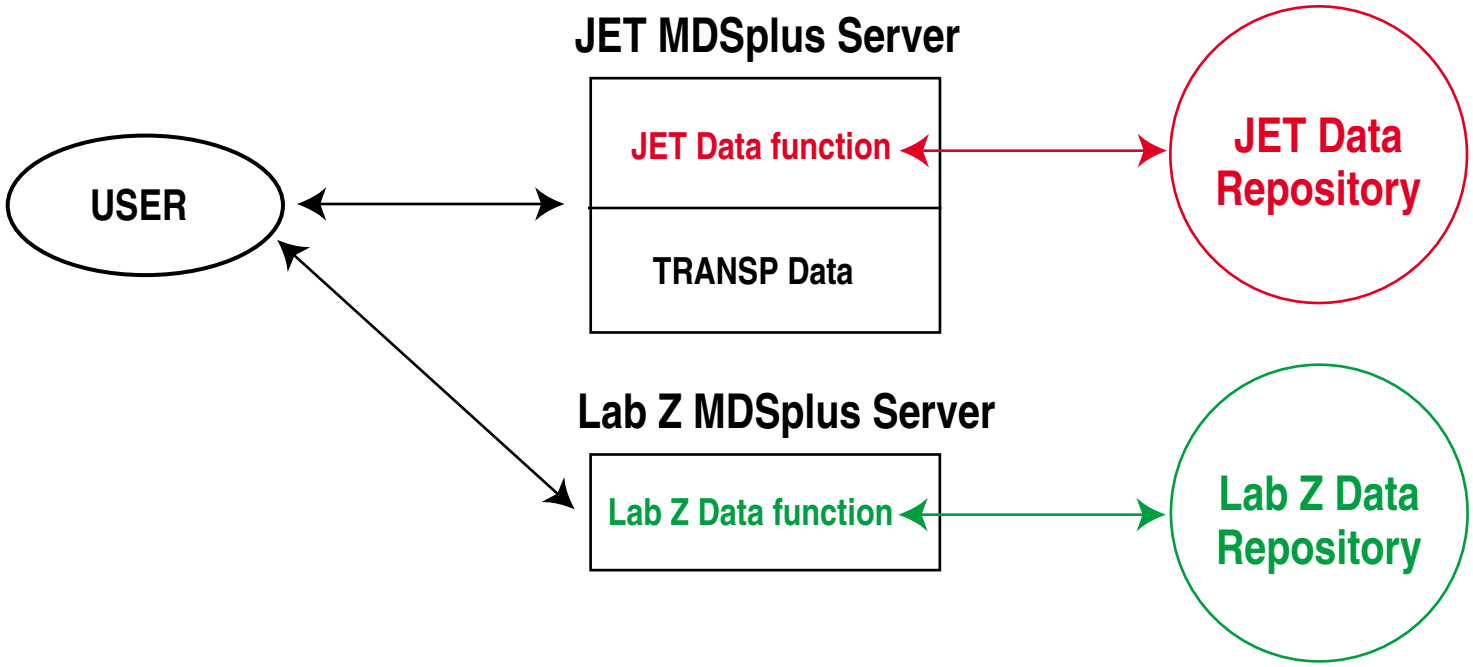
- MDSplus server initially installed inside the JET firewall
  - Available for testing inside JET only
- Testing was successful, server made available outside the firewall
  - Available from both inside and outside JET for testing
  - Data access speed is favorable
- Sample TRANSP output stored on JET MDSplus server
  - Location of data is transparent to the user
  - Easy to compare TRANSP data with JET measurements in any MDSplus aware visualization tool
- The testing at JET required less than 2 weeks of effort

ACCESSING JET DATA THROUGH MDSplus SUCCESSFUL



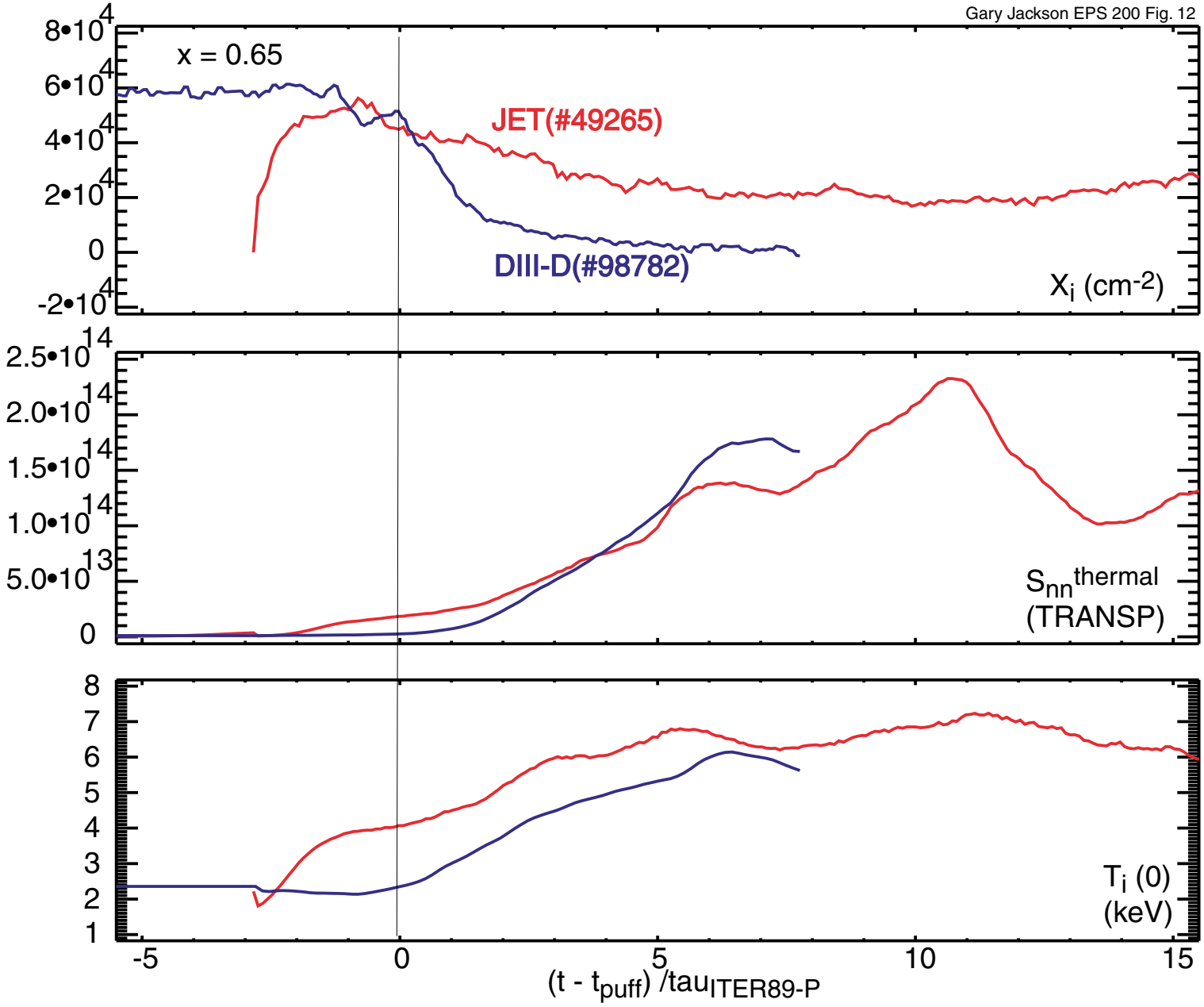
- User calls an MDSplus function on the JET server
- MDSplus internally calls native JET data access function
- TRANSP data not stored as part of JET data repository
- Storing TRANSP data directly in MDSplus makes it available to the user

POSITIVE JET MDSplus RESULTS CAN BE EXTENDED TO OTHER LABS



- One data interface to many laboratories

BENEFIT: EASY TO COMPARE DATA FROM MANY LABS THEREBY FACILITATING BROADER US/EUROPEAN COLLABORATION



JET

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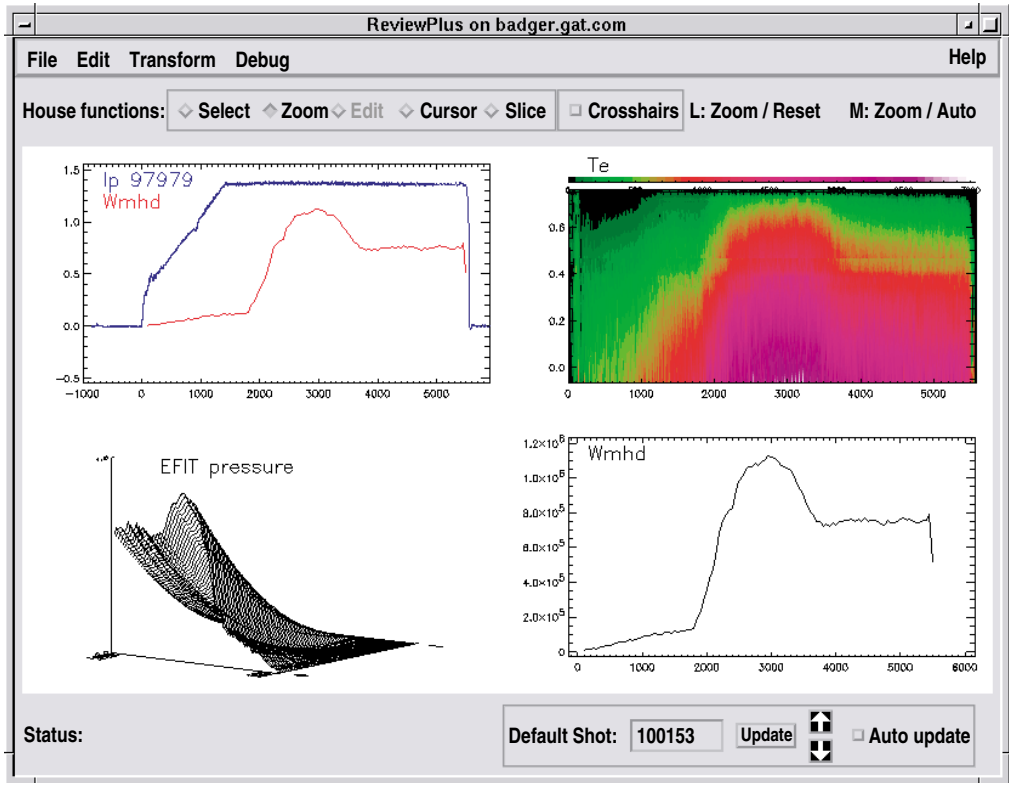
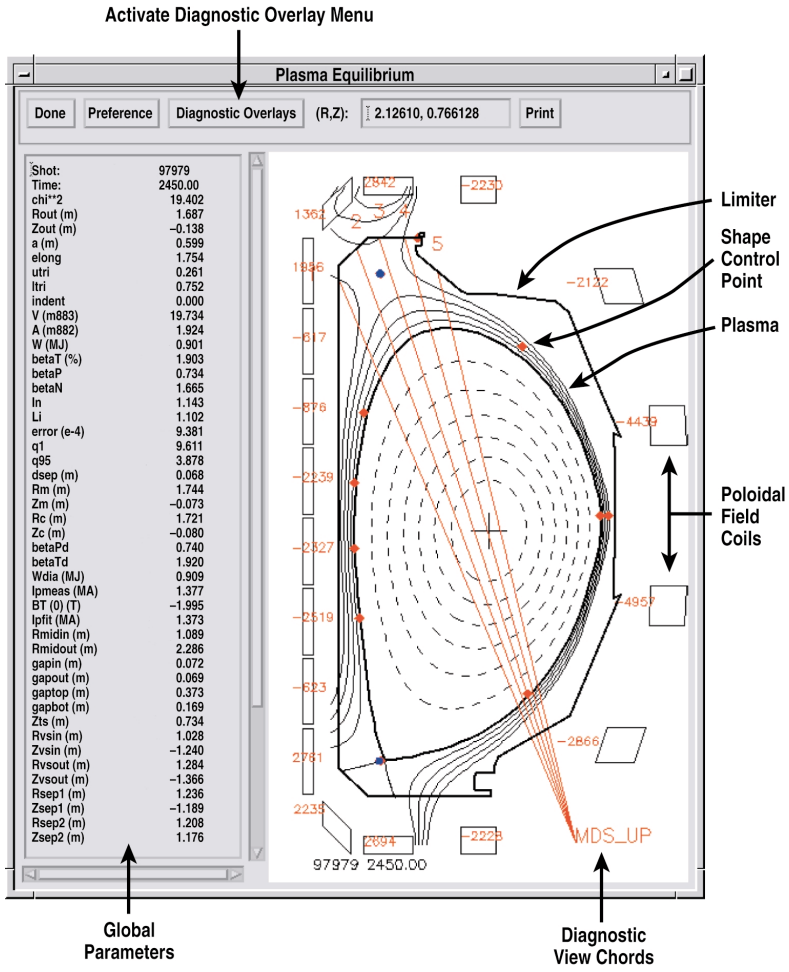
BENEFIT: USERS MORE EFFICIENT WITH THEIR OWN TOOLS

- For example, GA scientists in the JET control room

ReviewPlus



EFITViewer



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FUTURE WORK

- Continued testing and feedback by users both at JET and off–site
- Integrate MDSplus with a JET visualization tool
  - Allow the JET staff to gain MDSplus experience
- Install MDSplus client at another European site
  - Demonstrate ease of installation at a new site
- Extend client installation to full server installation
  - Provide access to another lab's repository to JET and other sites
- Expand our computer science collaborations
  - Discussions at this meeting can help to guide our direction